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White Paper

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The Panic-Proof Portfolio *A Bear Attack Survival Guide*

How to Survive a Bear Attack

1. Don't run
2. Drop to ground in fetal position
3. Play dead

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When Bears Attack

Bears can run up to forty miles per hour, about 60% faster than Olympic sprinters, and despite rumors to the contrary, are equally adept at running up and down hills. They can stand nine feet tall, weigh up to 1,700 pounds, and eat virtually anything. Who could blame us for panicking and running from such an intimidating beast? However, running from a bear is not a good idea. Apparently, a fleeing human looks like dinner.

What a cruel evolutionary trick—thwarting a bear attack conflicts with our “fight-or-flight” survival instincts. Now that we sense the bear’s ominous presence with the S&P 500 Index down 16.2% from its last October 31 level (through June 30, 2008), are we ready to assume the “fetal position” in our portfolios and hope the bear leaves us intact? The wildlife experts’ advice on avoiding bear attacks seems rational, but I was surprised they omitted the most obvious tip—stay out of the forest. When a bear unexpectedly arrives, even the bravest can panic and run. It is better to build a portfolio that keeps us “out of the forest” so we can remain rational.

Bear Sightings

Bear attacks are more common than many think. From 1926 – 2008, the S&P 500 Index spent about 23% of its time in official bear market territory (20% or more below its high) and about 36% of the time in correction territory (off at least 10%).

Exhibit 1 shows the S&P 500's historical declines from market peaks (from 1926 – June 2008). The red area illustrates how far the index had fallen from its prior high at any point in time. There were fourteen market corrections during this 82.5-year period. Seven turned into official bear markets. On average, the bear attacks came 11.8 years apart and lasted 4.8 years.

Exhibit 1
S&P 500 Index Declines from Prior Peaks (1/1926 – 6/2008)

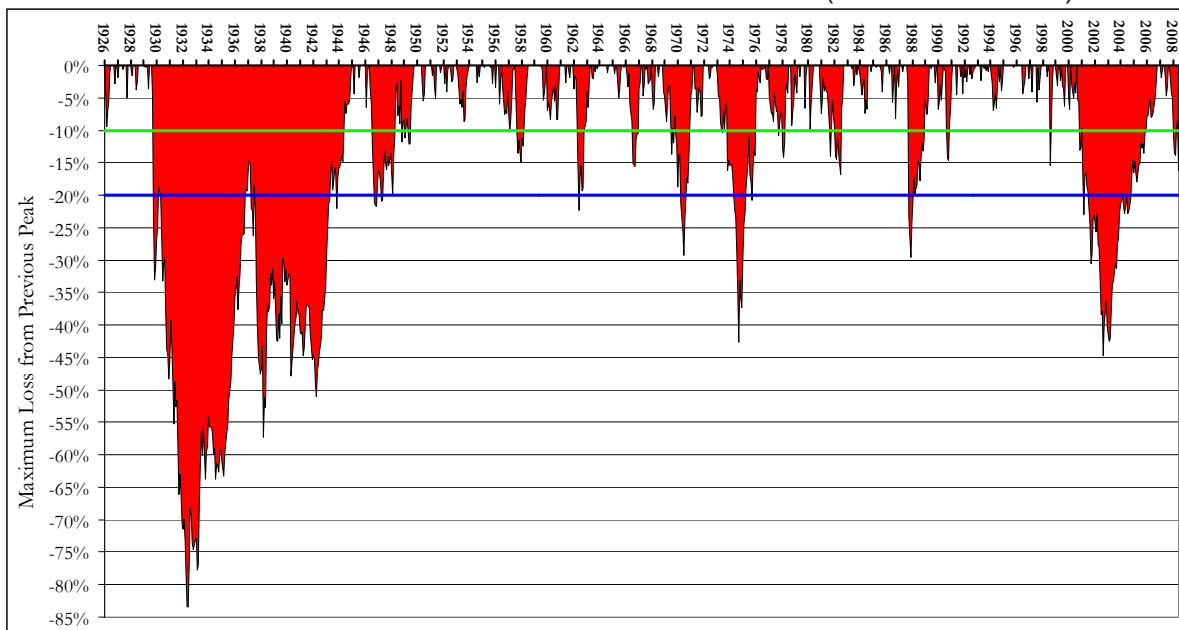
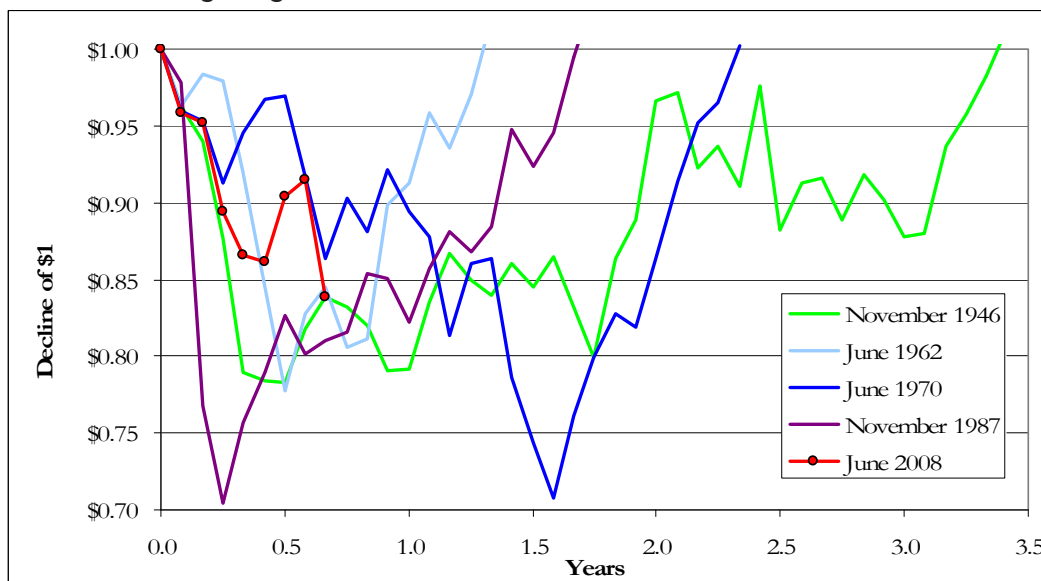


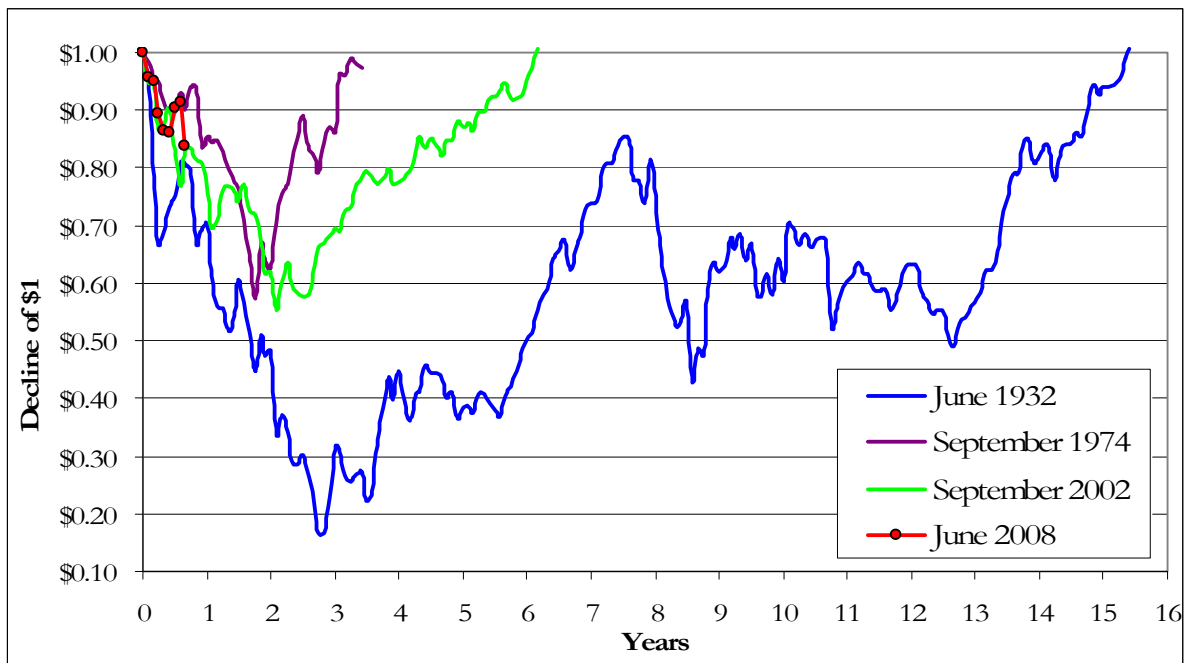
Exhibit 2
Current Bear Sighting vs. Moderate Bear Markets of 1946, 1962, 1970, and 1987



Note: Dates represent market bottoms of each bear market.

Exhibit 3

Current Bear Sighting vs. Severe Bear Markets of 1932, 1974 and 2002



Note: Dates represent market bottoms of each bear market.

While the 1932 bear attack was terrible, it was a *deflationary* bear market and not that much worse than the *inflationary* 1974 bear market in terms of real losses and duration (see Exhibit 4). While the nominal magnitude of the 1932 bear market was much more severe (-83.4% vs. -42.6%), consumer prices *declined* 21.4% during the peak-to-trough period for a real loss of 62%. The 1974 bear market was intensified by consumer price *increases* of 19.1%, leading to a real loss of 61.8%. It took the S&P 500 12 years to reach new inflation-adjusted highs after the 1974 bear market and 15.5 years for the 1932 bear market.

Exhibit 4

Historical Bear Attacks

Date of Bear Market Valley	Max (nominal) loss from peak to trough	Max (real) loss from peak to trough	Time from 20% loss to (nominal) break-even	Time from decline began to (nominal) break-even	Time from decline began to (real) break-even	Required return to break even (on nominal basis)	Years to break even with an 8% annual (nominal) return	Required return to break even (on real basis)	Years to break even with a 5% annual (real) return
June 1932	-83.4%	-62.0%	15.3	15.4	15.5	503%	23.3	163%	19.9
November 1946	-21.8%	-37.3%	3.2	3.3	4.4	28%	3.2	60%	9.6
June 1962	-22.3%	-22.9%	0.9	1.3	1.3	29%	3.3	30%	5.3
June 1970	-29.2%	-38.8%	1.0	2.3	4.0	41%	4.5	63%	10.1
September 1974	-42.6%	-61.8%	2.3	3.5	12.0	74%	7.2	162%	19.7
November 1987	-29.5%	-30.4%	1.7	1.8	1.9	42%	4.5	44%	7.4
September 2002	-44.7%	-49.5%	5.3	6.2	7.8*	81%	7.7	98%	14.0
Average Bear Market	-39.1%	-43.3%	4.2	4.8	6.5	64%	6.4	76%	11.6
June 2008**	-16.2%	-19.9%	N.A.	N.A.	N.A.	19%	2.3	24.8%	4.5

*As of June 30, 2008, the S&P 500 was still 28.9% below its (real) August of 2000 market high.

** Not official Bear Market as of June 30, 2008

While the 2002 bear market officially came to an end in October 2006 (as the S&P 500 hit new highs), it has yet to end in inflation-adjusted terms. As of June 2008, the index was about 30% below its inflation-adjusted peak of August 2000.

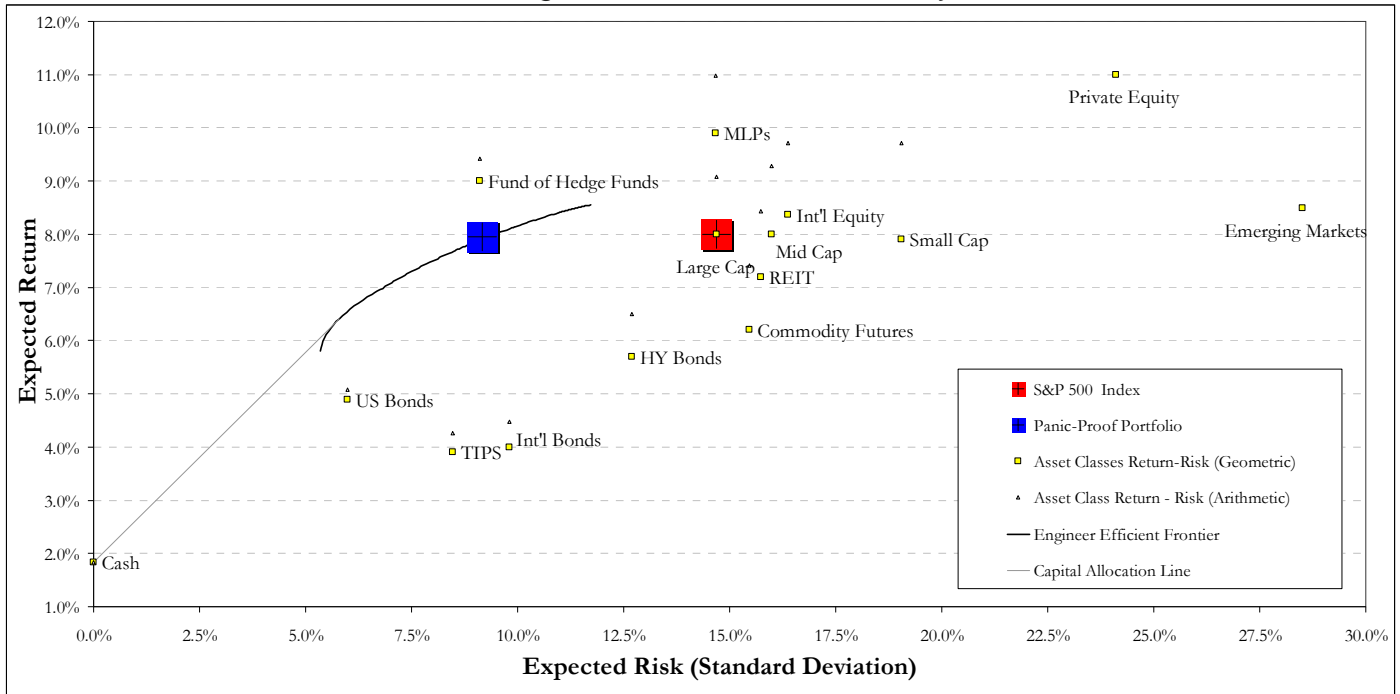
A Panic-Proof Portfolio

For insufficiently diversified investors, it is only a matter of time before a bear sighting leads to a dubious choice: assume the fetal position or run. Those of us with panic-proof portfolios currently stand beyond the edge of the forest and watch our terrified friends and neighbors. Sure, we are uneasy, but we are far from panic. Our portfolio diversification decisions have shielded us from the worst of the bear attack that began last November.

Knowledgeable investors knew the current lousy equity environment was possible (if not inevitable) when they constructed a “panic-proof portfolio” (a well-diversified strategic asset allocation) over the last several years. Knowing that we will spend considerable time in bear market territory, we want portfolios that will smooth the ride.

In the Frontier Engineer™ asset allocation study in Exhibit 5 below, the panic-proof portfolio seeks to match the expected 10-year forecasted return of US equities (+8.0% annual⁴), but with lower volatility and significantly less drama. Note that there is not just one “panic-proof portfolio”; we are picking one point on the efficient frontier. We could move down the frontier and decrease the volatility further, but that comes at the opportunity cost of expected returns lower than U.S. equities.

Exhibit 5
Frontier Engineer™ Risk & Return Analysis^{3,4}



Note: Expected risk & returns are 10-year (median) return, risk, & correlation forecasts (2008–2017).

Exhibit 6
Panic-Proof Allocation

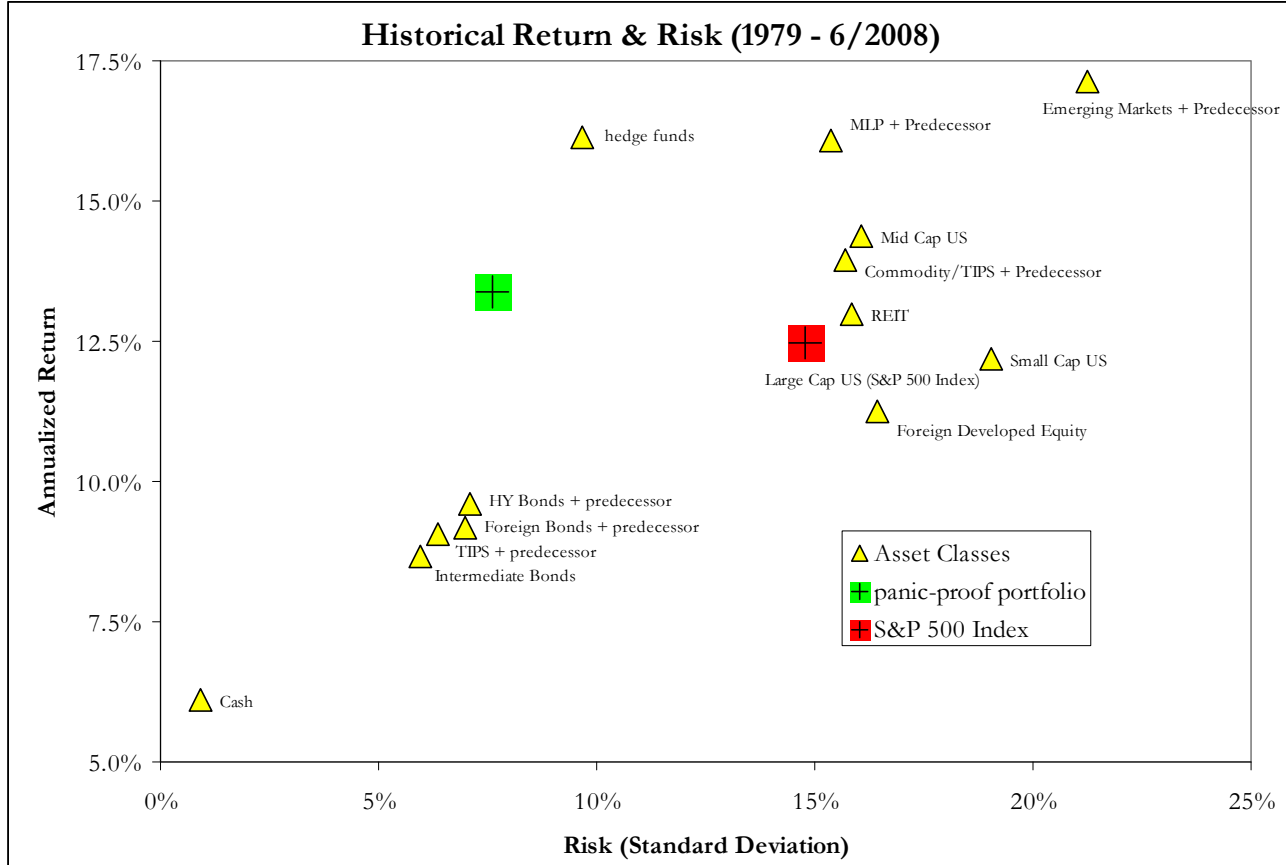
Narrow Asset Classes	Allocation	Nov. 07 – June 08 Return¹
1. Cash	0%	+1.7%
2. TIPS	6%	+8.8%
3. US Bonds	5%	+3.2%
4. Foreign Bonds (50% hedged) ²	6.5%	+4.3%
5. High Yield Bonds	5.5%	-2.9%
6. Large Cap US Equity	15%	-16.2%
7. Mid Cap US Equity	3%	-12.3%
8. Small Cap US Equity	3%	-15.9%
9. REITs	9%	-17.6%
10. Foreign Developed Equity	13%	-15.4%
11. Emerging Markets Equity	7%	-17.6%
12. Commodity Futures	12%	+37.7%
13. Fund of Hedge Funds	10%	-3.6%
14. Energy Infrastructure MLPs	5%	-7.7%

Broad Asset Classes	Allocation	Nov. 07 – June 08 Return¹
1. Global Bonds	17%	+1.6%
2. Global Equities	41%	-15.9%
3. Real Assets	32%	+9.5%
4. Absolute Return	10%	-3.6%

Recent Bear Sighting (11/1/07 – 6/30/08)¹:	
S&P 500 Index:	-16.2%
Panic-Proof Portfolio Mix:	-4.1%

Exhibit 7

Asset Class Return & Risk vs. the Panic-Proof Portfolio (1/1979 – 6/2008)^{1,5}

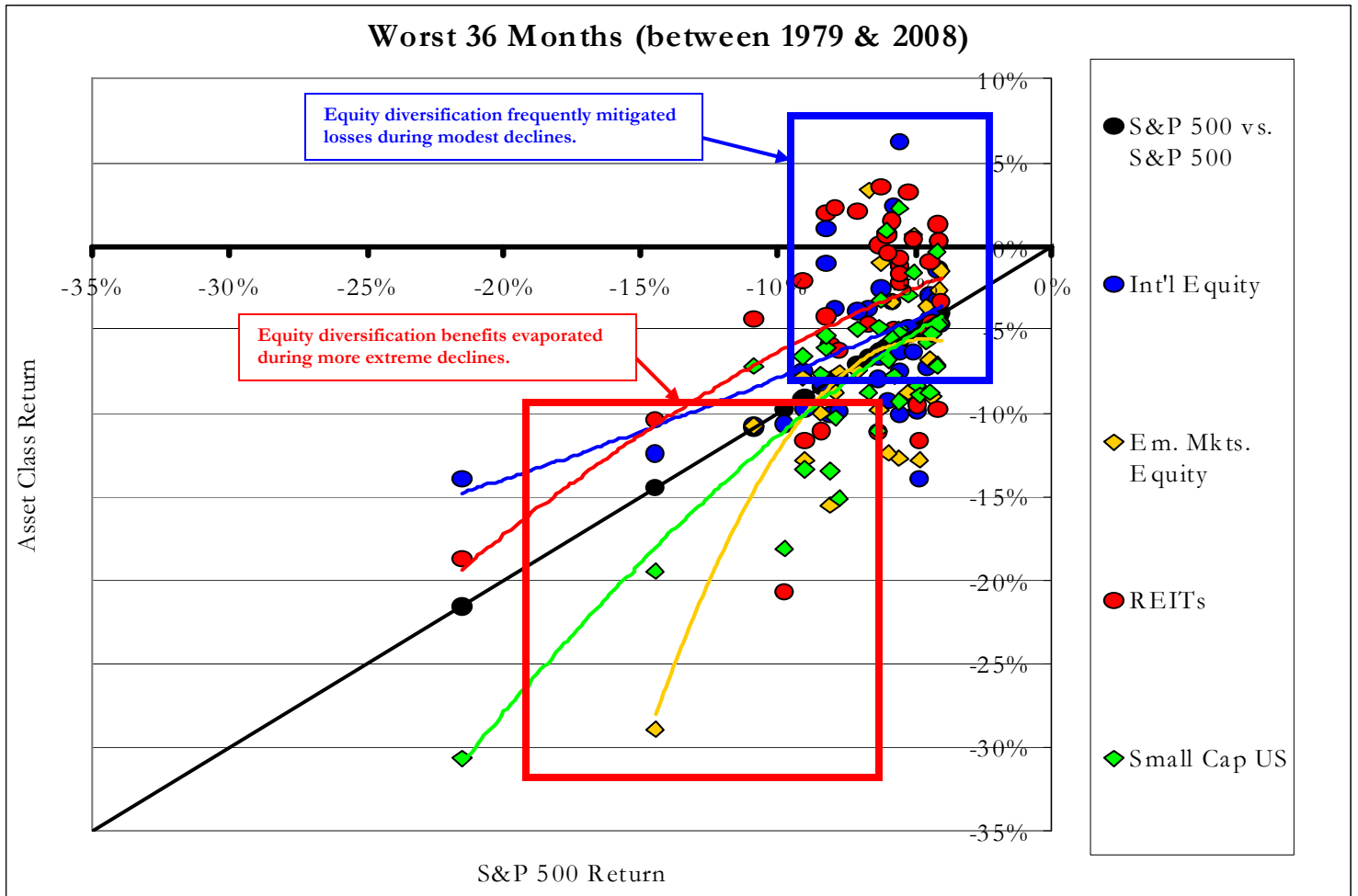


Bear Chases Global Equities

Global equity diversification improved historical long-term risk-adjusted returns. However, we knew long before last November that global equity market correlations often rise during periods of stress. Therefore, a panic-proof portfolio must include other real and alternative assets that maintain their low or even falling correlations when the domestic equity market is under attack.

Exhibit 8 shows the S&P 500's bottom decile of monthly returns from January 1979 to June 30, 2008. The bottom decile (or worst 36 months) equated to a 3.9% (or greater) monthly loss. As the exhibit shows, most equity categories lost their diversification benefits at the extreme levels of loss—just when needed most!

Exhibit 8
Global Equities & REITs Running Together in Times of Stress¹



Portfolio Anchors

We know that inflationary pressures wreak havoc on most financial assets, so we include TIPS (returned +8.8%¹ from 11/1/07 – 6/30/08). We know the U.S. dollar often weakens when risky U.S. assets deflate, and that foreign bonds are one of the few financial assets with declining correlations in periods of stress, so we have exposure to unhedged foreign bonds (+7.9%¹ from 11/1/07 – 6/30/08) for currency diversification. We own investment-grade U.S. (nominal) bonds in case of unanticipated deflationary turmoil (+3.2%¹ from 11/1/07 – 6/30/08). We own high yield bonds because they offer a risk premium over investment-grade assets, and the evidence shows they often, although not always, held up relatively well under stress (-2.9%¹ from 11/1/07 – 6/30/08). Exhibit 9 shows how these asset classes endured periods of stress.

Exhibit 9
Various Fixed Income Markets in Times of Stress¹

Worst 36 Months (between 1979 & 2008)

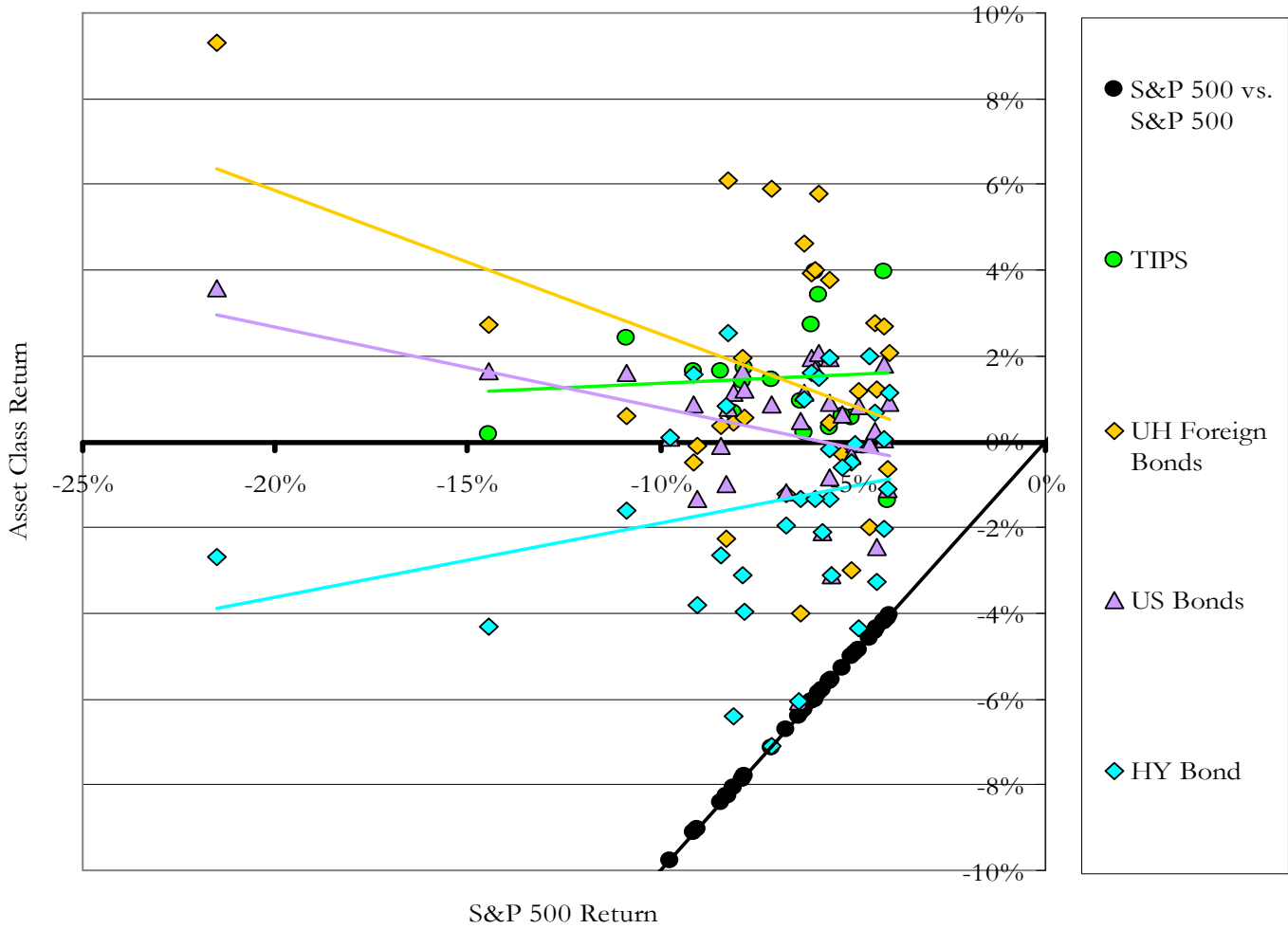
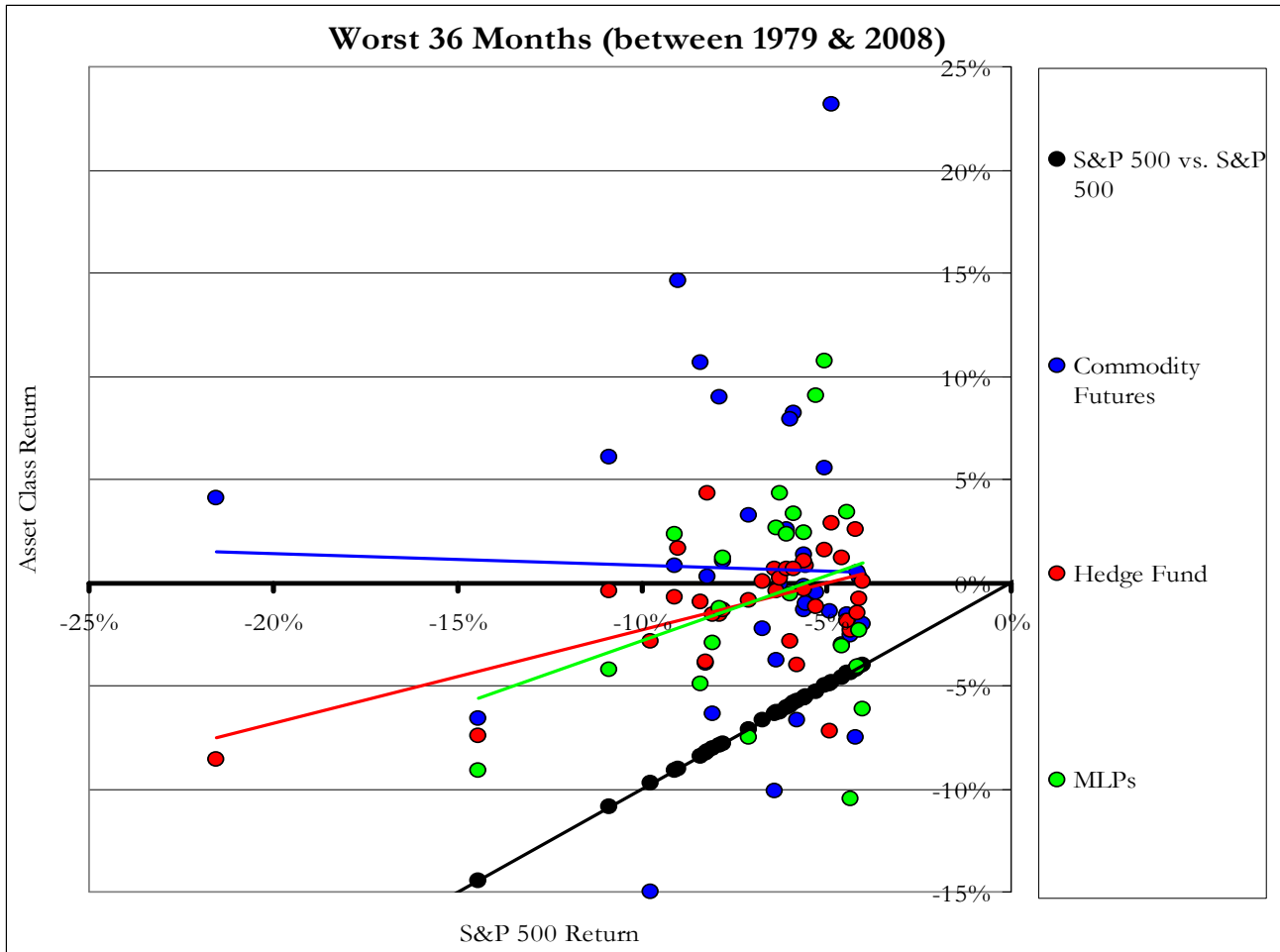


Exhibit 10

'Esoteric' Asset Classes in Times of Stress



Portfolio Warriors and Heroes

Our research shows that commodity futures have enjoyed low correlations to equities and the correlations have even often turned very negative during periods of high, unexpected inflation. They have served as a potential savior when a portfolio hero needed most. Many factors that drive financial assets down also drive commodity prices up. Accordingly, we have included commodity futures collateralized by TIPS (+37.7%¹ from 11/1/07 – 6/30/08) in our asset allocation. We also diversified to hedge funds (or fund of funds) to reduce our “equity beta” exposures, (knowing that we may be assuming all kinds of other esoteric risks). The average multi-strategy fund of hedge fund posted modest losses (-3.6%¹ from 11/1/07 – 6/30/08). We diversified to other asset classes like Energy Infrastructure MLPs, which have historically held up well during bear markets (-7.7%¹ from 11/1/07 – 6/30/08). Any loss is unpleasant, but a modest loss pokes the bear in the eye.

Low Volatility Tailwind

The best way to make money is not to lose it in the first place! Lowering portfolio volatility through diversification, while maintaining the same expected weighted-average return from underlying holdings, increases *geometric* returns. Exhibit 14 illustrates how a portfolio allocated equally between the S&P 500 Index, Commodity Futures, and REITs had a higher annualized return (12.7%) than the highest returning asset class on a stand-alone basis (e.g., commodity futures with a 12.5% return). The average return of the three asset classes was 11.7%. However, they delivered a 12.7% return when working as a team. The low volatility tailwind added 1% to return. The diversification moderated the

worst year considerably and lowered the portfolio standard deviation to 10.6%, which was about 7% lower than the S&P 500 and REITS (both 17.5%). Commodity Futures volatility (19.5%) was about 9% higher.

Exhibit 14
Lose Less = Make More!

Calendar Year	S&P 500 Index	Commodity Futures	REITs	1/3 in each; rebalanced annually
1991	30%	-1%	20%	16%
1992	8%	7%	7%	7%
1993	10%	5%	15%	10%
1994	1%	9%	2%	4%
1995	38%	29%	14%	27%
1996	23%	21%	37%	27%
1997	33%	-6%	20%	16%
1998	29%	-28%	-17%	-6%
1999	21%	22%	-3%	13%
2000	-9%	41%	31%	21%
2001	-12%	-16%	10%	-6%
2002	-22%	44%	3%	8%
2003	29%	32%	37%	33%
2004	11%	17%	35%	21%
2005	5%	21%	14%	13%
2006	16%	-2%	36%	16%
2007	5%	24%	-18%	4%
6/30/2008	-12%	32%	-3%	5%
Geometric Return	10.3%	12.5%	12.3%	12.7%
Growth of \$1	\$5.53	\$7.89	\$7.57	\$8.11
Min Return	-22.1%	-28.0%	-17.7%	-5.9%
Max Return	37.6%	44.0%	37.1%	32.5%
Arithmetic Return	11.6%	14.3%	13.6%	13.2%
Standard Deviation	17.5%	19.5%	17.5%	10.6%

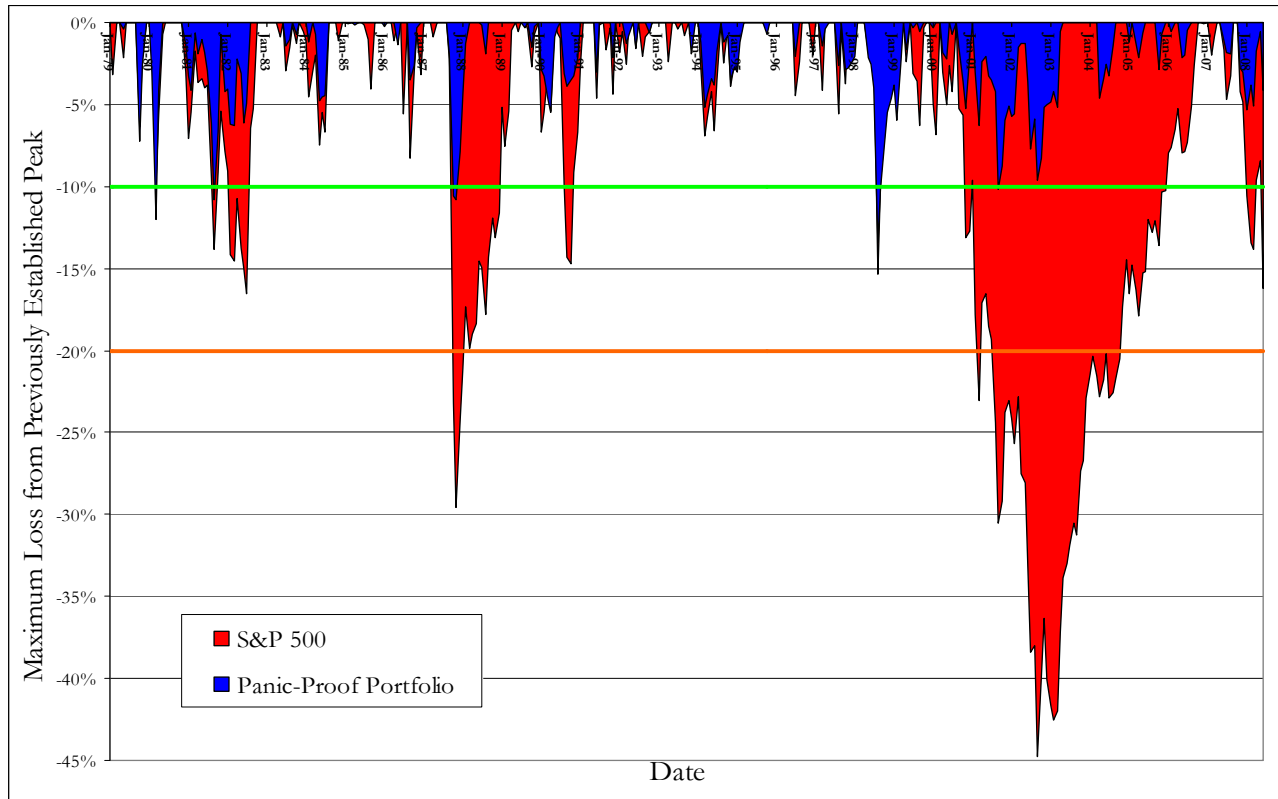
Diversification that lessens losses during bear attacks not only mitigates panic, but can also increase long-term returns. The average of the seven bear market peak-to-trough losses between 1926 & 2008 was 39.1%. Once a portfolio loses 39%, you need a 64% return to break even. However, if diversification moderates a 39% bear market loss to a 10% loss, you only need an 11% return to break even.

Panic-Proof Portfolio during Bear Attacks

The following analysis in Exhibit 11 shows how the panic-proof portfolio shielded us from bear attacks. It shows the maximum peak-to-trough losses at the end of every month from January 1979 – June 2008. During this period, the S&P 500 index returned an annualized 12.5%, while the panic-proof portfolio^{5,6} returned 13.4% (see Exhibit 12). While history is not destiny, we did not have to sacrifice return to panic-proof our portfolios over the last three decades.

Exhibit 11

The S&P 500 Index vs. the Panic-Proof Portfolio (1/1979 – 6/2008)^{5,6}



Past performance is no guarantee of future returns.

Exhibit 12

The S&P 500 Index vs. the Panic-Proof Portfolio (1/1979 – 6/2008)^{5,6}

	S&P 500 Index	Panic-Proof Portfolio
1979 - 6/2008 Statistics		
Geometric Annualized Returns	12.5%	13.4%
Annualized Standard Deviation	14.8%	8.8%
<i>Maximum Historical Drawdown</i>	-44.7%	-13.4%
<i>Duration of Drawdown (Years)</i>	2.0	0.2
Growth of \$1 million	\$32.0	\$40.4
Maximum Calendar Year Return	38%	33%
Minimum Calendar Year Return	-22%	-3%
<i>11/1/07 - 6/30/08 Return</i>	-16.2%	-4.1%

Exhibit 13 shows the periods from 1979 – June 2008 when the S&P 500 Index was at least 10% off its peak compared to the panic-proof portfolio. On average, the panic-proof portfolio significantly moderated losses. In the periods when it was at least 10% off its high, the S&P 500 averaged a -21.6% return. On average, the panic-proof portfolio returned -2.4% during the same periods with a maximum draw down of -13.4% (August 1998) versus -44.7% (September 2002) for the S&P 500 Index. At the point when the S&P 500 was 44.7% off its high in September 2002, the panic-proof portfolio was down 9.7% from its peak.

Exhibit 13

Panic-Proof Portfolio during Historical Corrections and Bear Markets (1979 – 2008)

Date	S&P 500	Panic-Proof Portfolio	Date	S&P 500	Panic-Proof Portfolio	Date	S&P 500	Panic-Proof Portfolio
Sep-81	-13.8%	-10.8%	May-01	-16.5%	-2.0%	Nov-03	-26.7%	1.5%
Feb-82	-14.1%	-6.2%	Jun-01	-18.5%	-3.2%	Dec-03	-22.9%	4.6%
Mar-82	-14.6%	-6.3%	Jul-01	-19.3%	-3.5%	Jan-04	-21.5%	1.9%
Apr-82	-10.7%	-2.2%	Aug-01	-24.4%	-4.2%	Feb-04	-20.4%	2.5%
May-82	-13.8%	-3.1%	Sep-01	-30.5%	-10.2%	Mar-04	-21.6%	1.5%
Jun-82	-15.1%	-6.1%	Oct-01	-29.2%	-8.7%	Apr-04	-22.8%	-4.6%
Jul-82	-16.6%	-4.9%	Nov-01	-23.7%	-6.0%	May-04	-21.7%	-3.4%
Oct-87	-23.3%	-10.6%	Dec-01	-23.1%	-5.1%	Jun-04	-20.2%	-2.6%
Nov-87	-29.6%	-10.8%	Jan-02	-24.2%	-5.8%	Jul-04	-22.9%	-3.2%
Dec-87	-24.2%	-7.9%	Feb-02	-25.7%	-5.6%	Aug-04	-22.6%	-1.5%
Jan-88	-21.0%	-4.4%	Mar-02	-22.9%	-1.5%	Sep-04	-21.7%	1.0%
Feb-88	-17.4%	-1.3%	Apr-02	-27.5%	-1.3%	Oct-04	-20.5%	2.2%
Mar-88	-19.9%	0.6%	May-02	-28.1%	-1.3%	Nov-04	-17.3%	3.5%
Apr-88	-19.0%	1.3%	Jun-02	-33.2%	-3.6%	Dec-04	-14.5%	2.3%
May-88	-18.3%	0.5%	Jul-02	-38.4%	-7.7%	Jan-05	-16.6%	-1.2%
Jun-88	-14.6%	2.4%	Aug-02	-38.0%	-5.9%	Feb-05	-14.8%	1.7%
Jul-88	-14.9%	-0.1%	Sep-02	-44.7%	-9.7%	Mar-05	-16.3%	-1.3%
Aug-88	-17.8%	-1.9%	Oct-02	-39.9%	-8.3%	Apr-05	-17.9%	-2.1%
Sep-88	-14.3%	0.4%	Nov-02	-36.3%	-5.2%	May-05	-15.3%	-0.6%
Oct-88	-11.9%	3.2%	Dec-02	-40.1%	-5.0%	Jun-05	-15.2%	1.2%
Nov-88	-13.2%	1.0%	Jan-03	-41.6%	-4.8%	Jul-05	-12.0%	3.1%
Dec-88	-11.6%	2.1%	Feb-03	-42.5%	-4.2%	Aug-05	-12.8%	1.2%
Sep-90	-14.3%	-3.9%	Mar-03	-42.0%	-5.2%	Sep-05	-12.1%	2.0%
Oct-90	-14.7%	-3.5%	Apr-03	-37.2%	-0.6%	Oct-05	-13.6%	-2.9%
Aug-98	-15.4%	-13.4%	May-03	-33.9%	4.9%	Nov-05	-10.3%	-0.7%
Nov-00	-13.1%	-5.2%	Jun-03	-33.0%	1.0%	Dec-05	-10.3%	1.2%
Dec-00	-12.7%	-2.0%	Jul-03	-31.8%	0.8%	Jan-08	-10.6%	-5.3%
Feb-01	-17.8%	-3.1%	Aug-03	-30.5%	2.4%	Feb-08	-13.5%	-3.9%
Mar-01	-23.0%	-6.2%	Sep-03	-31.3%	1.8%	Mar-08	-13.8%	-5.1%
36982.00	-17.1%	-2.4%	Oct-03	-27.4%	3.8%	Jun-08	-16.2%	-4.1%

Average S&P 500 Index Return: -21.7%

Average Panic-Proof Portfolio Mix: -2.4%

Admittedly, the panic-proof portfolio is not completely devoid of drama. As of June 30, 2008, we have taken our share of lumps in our global equity and real estate allocations, but the diversification to real and alternative assets elsewhere has limited the bleeding. We are nervous, and rightfully so, but we are not panicking.

Conclusion

One of the first questions posed to investment advisors by clients during bear sightings is, “What should we change?” This is a far less common question during “good times.” Reactively shifting investment strategy during or immediately after periods of turmoil is often a recipe for disaster. It is sensible to moderate the urge to run from the bear by adopting a panic-proof portfolio. Thoughtful diversification strategies eliminate risk that is not adequately compensated in your portfolio. In the end, we don’t really need protection from the bear at all. The protection we need is from ourselves.

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Disclosures & Footnotes:

¹Asset class returns were calculated from indexes (and predecessor indexes) listed below.

²Unhedged foreign bonds returned +7.9% and hedged foreign bonds returned +0.8% (from 11/1/07 – 6/30/08). A 50-50 mix between the two returned +4.3%.

³The panic-proof portfolio is an unconstrained Frontier Engineer™ portfolio that matches expected large cap U.S. Equity return forecasts (1/1/08 – 12/31/17) shown below.

⁴Expected 10-year risk, return and correlation forecasts (1/1/08 – 12/31/17) of all asset classes are shown below.

⁵Panic-proof portfolio historical performance calculation methodology is shown below. It assumed monthly rebalancing.

⁶Past performance is no guarantee of future risks or returns.

Disclosures: This paper contains figures pertaining to historical and projected return and risk. Historical returns and risks were calculated using index benchmarks. Some of the return streams (from 1979 – 2008) represent a single index, while others represent linked performance to another (predecessor) index in the same or a different asset class. It is impossible to invest directly in any index. The return, risk, and correlation forecasts are not guaranteed. The panic-proof portfolio’s historical returns were calculated using market indexes (rebalanced monthly) and are not intended to predict performance of any investment or asset allocation strategy. Portfolios allocated to the panic-proof portfolio’s target asset allocation may have experienced higher or lower returns based on cash flows, investment manager performance, expenses, or other factors. The term, “panic-proof” is a subjective term and not meant to imply that it (or any similar investment or asset allocation strategy) is appropriate or completely free of panic for all investors. Depending on an investor’s objectives and risk constraints, a lower risk portfolio may be appropriate. The panic-proof portfolio asset allocation strategy could have much higher volatility in the future. Past performance is no guarantee of future performance. No diversification strategy can guarantee a gain.

Panic-Proof Portfolio Performance Calculation Methodology

Asset Class	Dates Used	Most Recent Index Proxy	Prior Index Proxy	Dates Used	Allocation	Return	St. Dev.
Cash	1/1979-6/2008	Citigroup 3-month T-Bill	N.A.	N.A.	0%	6.1%	0.9%
TIPS + Predecessor	3/1997-6/2008	Citigroup Inflation-Linked Securities	Lehman Aggregate Bond	1/1979-4/1997	6%	9.1%	6.4%
Intermediate Bonds	1/1979-6/2008	Lehman Aggregate Bond Index	N.A.	N.A.	5%	8.7%	6.0%
Foreign Bonds + Predecessor	1/1985-6/2008	50/50 Citigroup Foreign Bond (H/UH)	Lehman Aggregate Bond	1/1979-12/1984	7%	9.2%	7.0%
HY Bond + Predecessor	11/1984-6/2008	Merrill Lynch High Yield Master	Lehman Aggregate Bond	1/1979-10/1984	6%	9.6%	7.1%
Large Cap	1/1979-6/2008	S&P 500	N.A.	N.A.	15%	12.5%	14.8%
Mid Cap	1/1979-6/2008	Russell MidCap	N.A.	N.A.	3%	14.4%	16.1%
Small Cap	1/1979-6/2008	Russell 2000	N.A.	N.A.	3%	12.2%	19.1%
REIT	1/1979-6/2008	DJ Wilshire Real Estate Sec.	N.A.	N.A.	9%	13.0%	15.9%
Intl Equity	1/1979-6/2008	MSCI EAFE	N.A.	N.A.	13%	11.3%	16.5%
Em. Mkt. Eq. + Predecessor	1/1988-6/2008	MSCI Emerging Markets Free	MSCI EAFE	1/1979-12/1987	7%	17.1%	21.2%
Commodities/TIPS + Predecessor	1/1991-6/2008	DJ AIG Commodity Index + Citi Infl-Linked Secur(97-04) & Lehman Agg(before 97-91) - Citigroup 3-Month T-Bill	Goldman Sachs Commodity Index + Lehman Agg Citigroup 3-Month T-Bill	1/1979-12/1990	12%	14.0%	15.7%
Fund of Hedge Funds	1/1990-6/2008	HFRI Fund of Funds Index	HFN Hedge Fund Agg. Ave.	1/1979-12/1989	10%	15.9%	9.7%
MLPs + Predecessor	1/1991-6/2008	Alerian MLP Index (1/96 - 5/06), Atlantic MLP Index (1/1991-12/1995)	Goldman Sachs Commodity Index + Lehman Agg Citigroup 3-Month T-Bill	1/1979-12/1990	5%	16.1%	15.4%
Total Portfolio	1/1979-6/2008	N.A.	N.A.	N.A.	100%	13.4%	7.6%

2008-2017 Capital Market Assumptions (Expected Median Scenarios)

ASSET CLASS	Expected Median Annual Return	Expected Geometric Annual Return*	Expected Risk (σ)	Debt, Equity or Alternative																
					Cash	TIPS	US Bonds	Int'l Bond	HY Bond	Large Cap US	Mid Cap US	Small Cap US	REITs	Int'l Equity	Em. Mkts. Equity	Commodity Futures	Hedge Fund	MLPs		
Cash	1.4%	1.4%	0.0%	D	Cash	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TIPS	4.3%	3.9%	8.5%	D	TIPS	0.00	1.00	0.78	0.57	0.02	-0.20	-0.15	-0.19	0.04	-0.17	-0.12	0.46	-0.07	0.14	
US Bonds	5.1%	4.9%	6.0%	D	US Bonds	0.00	0.78	1.00	0.48	0.32	0.23	0.23	0.13	0.22	0.16	-0.06	0.34	0.07	0.22	
Int'l Bond	4.5%	4.0%	9.8%	D	Int'l Bond	0.00	0.57	0.48	1.00	0.07	0.00	-0.04	-0.09	-0.02	0.41	0.00	0.21	-0.04	0.12	
HY Bond	6.5%	5.7%	12.7%	D	HY Bond	0.00	0.02	0.32	0.07	1.00	0.51	0.55	0.56	0.45	0.37	0.42	0.02	0.35	0.45	
Large Cap US	9.1%	8.0%	14.7%	E	Large Cap US	0.00	-0.20	0.23	0.00	0.51	1.00	0.93	0.80	0.55	0.57	0.59	0.14	0.44	0.26	
Mid Cap US	9.3%	8.0%	16.0%	E	Mid Cap US	0.00	-0.15	0.23	-0.04	0.55	0.93	1.00	0.93	0.66	0.56	0.62	0.16	0.52	0.32	
Small Cap US	9.7%	7.9%	19.1%	E	Small Cap US	0.00	-0.19	0.13	-0.09	0.56	0.80	0.93	1.00	0.68	0.52	0.62	0.13	0.55	0.32	
REITs	8.4%	7.2%	15.7%	E	REITs	0.00	0.04	0.22	-0.02	0.45	0.55	0.66	0.68	1.00	0.37	0.34	0.15	0.20	0.32	
Int'l Equity	9.7%	8.4%	16.4%	E	Int'l Equity	0.00	-0.17	0.16	0.41	0.37	0.57	0.56	0.52	0.37	1.00	0.59	0.18	0.40	0.24	
Em. Mkts. Equity	12.6%	8.5%	28.5%	E	Em. Mkts. Equity	0.00	-0.12	-0.06	0.00	0.42	0.59	0.62	0.62	0.34	0.59	1.00	0.11	0.61	0.28	
Commodity Futures	7.4%	6.2%	15.5%	A	Commodity Futures	0.00	0.46	0.34	0.21	0.02	0.14	0.16	0.13	0.15	0.18	0.11	1.00	0.25	0.24	
Hedge Fund	9.4%	9.0%	9.1%	A	Hedge Fund	0.00	-0.07	0.07	-0.04	0.35	0.44	0.52	0.55	0.20	0.40	0.61	0.25	1.00	0.18	
MLPs	11.0%	9.9%	14.7%	A	MLPs	0.00	0.14	0.22	0.12	0.45	0.26	0.32	0.32	0.32	0.24	0.28	0.24	0.18	1.00	

*Geometric Annual Returns are expressed as if returns were normally distributed (i.e., median = mean arithmetic return). Frontier Engineer™ optimization uses non-normal return assumptions in its probabilistic optimization.

Assuming normally distributed returns, **Geometric Returns = Arithmetic Returns - (Portfolio Variance / 2)**.